

TABLE 2.—Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during September 1942. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second—Continued

Altitude (meters) m. s. l.	Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (338 m.)			Rapid City S. Dak. (982 m.)			Saint Louis Mo. (181 m.)			Saint Paul, Minn. (225 m.)			San An- tonio, Tex. (240 m.)			San Diego, Calif. (15 m.)			Sault Ste. Marie, Mich. (230 m.)			Seattle, Wash. (12 m.)			Spokane, Wash. (603 m.)			Washing- ton, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity			
Surface.....	30	273	4.4	30	188	3.9	28	227	1.3	30	65	1.1	29	327	3.3	29	206	1.4	29	251	1.0	30	107	1.7	28	277	4.1	23	273	2.4	30	278	2.4	30	234	1.6	29	318	1.1
500.....	30	288	2.4	30	186	4.2	28	219	1.5	30	38	0.5	29	212	2.0	29	266	1.6	30	110	1.4	30	110	1.4	28	296	3.3	23	273	3.5	30	271	1.1	28	306	2.7			
1,000.....	25	312	1.6	30	191	4.5	28	229	2.6	30	256	0.7	29	322	3.3	28	232	2.6	27	250	2.5	30	111	2.4	26	201	1.1	23	267	5.4	25	238	1.0	30	230	1.4	27	295	3.2
1,500.....	25	290	.6	28	211	5.3	25	237	5.2	30	232	1.1	29	312	4.2	27	243	4.4	21	253	2.6	30	149	2.0	26	170	2.9	21	273	6.9	24	249	1.4	30	232	1.8	27	286	4.2
2,000.....	25	192	8.7	27	231	6.0	23	250	7.7	30	226	2.5	28	303	5.4	26	270	6.1	19	286	4.6	29	163	2.0	26	167	3.7	20	280	7.9	19	187	.7	30	243	2.2	25	283	5.4
2,500.....	25	189	2.0	25	246	6.8	19	255	10.8	30	219	3.4	26	297	6.0	25	271	7.5	14	291	8.8	25	195	2.4	26	176	4.2	14	290	10.4	16	184	.7	28	273	3.3	24	282	7.1
3,000.....	25	204	.4	22	268	6.3	17	264	10.7	30	209	3.8	23	299	8.1	23	277	8.4	13	280	10.2	24	211	3.0	26	178	3.9	11	290	11.5	13	235	1.6	25	286	2.9	22	283	9.4
4,000.....	25	204	.9	21	281	7.2	16	277	12.6	28	205	4.2	19	301	9.9	21	281	9.7	---	---	---	21	212	1.7	25	213	4.2	---	---	---	---	---	---	---	---	---	---	---	---
5,000.....	25	265	3.0	21	275	7.4	14	279	13.6	28	213	4.0	14	289	7.8	17	281	10.7	---	---	---	17	235	2.0	25	231	4.7	---	---	---	---	---	---	---	---	---	---	---	---
6,000.....	22	260	2.8	20	279	8.0	14	277	15.6	28	228	5.6	13	286	9.0	15	275	13.3	---	---	---	17	215	1.6	24	249	5.5	---	---	---	---	---	---	---	---	---	---	---	
8,000.....	20	280	6.6	18	288	11.2	10	268	22.4	25	245	8.3	11	276	12.5	---	---	---	---	---	---	13	78	1.6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
10,000.....	18	283	6.8	17	264	15.3	---	---	---	24	255	15.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
12,000.....	13	297	7.1	14	263	18.8	---	---	---	19	261	19.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
14,000.....	12	266	10.3	12	263	17.2	---	---	---	11	258	13.7	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
16,000.....	10	---	---	10	255	13.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

LATE REPORT FOR AUGUST 1942

Altitude (meters) m. s. l.	Joliet, Ill. (178 m.)			Altitude (meters) m. s. l.	Joliet, Ill. (178 m.)		
	Observations	Direction	Velocity		Observations	Direction	Velocity
Surface.....	31	212	2.2	2,000.....	25	257	4.8
500.....	31	227	3.2	2,500.....	20	272	5.1
1,000.....	31	240	4.3	3,000.....	17	279	5.3
1,500.....	27	246	4.2	4,000.....	10	299	7.2

TABLE 3.—Maximum free air wind velocities (m. p. s.), for different sections of the United States based on pilot-balloon observations during September 1942

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast ¹	44.4	SSW	1,000	27	Boston, Mass.	50.2	SW	5,000	28	Portland, Maine	76.4	WNW	11,200	8	Caribou, Maine.
East-Central ²	26.8	WSW	2,040	24	Cincinnati, Ohio	37.0	WSW	5,000	24	Greensboro, N. C.	64.8	WSW	10,160	28	Washington, D. C.
Southeast ³	22.5	E	910	29	Atlanta, Ga.	28.4	SW	4,530	27	Atlanta, Ga.	43.0	ENE	19,380	16	Miami, Fla.
North-Central ⁴	37.9	NW	1,200	25	Rapid City, S. Dak.	48.2	NW	4,900	28	S. Ste. Marie, Mich.	55.0	W	7,870	25	Milwaukee, Wis.
Central ⁵	41.8	W	2,500	30	Fort Wayne, Ind.	47.5	WNW	4,960	27	Moline, Ill.	61.0	WSW	8,630	19	Omaha, Nebr.
South-Central ⁶	30.9	SSW	1,890 (1,310)	18	Abilene, Tex.	32.4	NNW	4,620	27	Tulsa, Okla.	55.0	SW	12,570	15	Little Rock, Ark.
Northwest ⁷	31.2	N	1,510	25	Billings, Mont.	40.8	WNW	3,680	15	Ellensburg, Wash.	64.0	SW	10,660	26	Oklahoma City, Okla.
West-Central ⁸	36.9	SSW	2,500	9	Modena, Utah	59.8	SSW	2,840	9	Modena, Utah	71.0	WSW	12,630	19	Billings, Mont.
Southwest ⁹	24.4	SSW	2,400	9	Las Vegas, Nev.	33.8	S	3,900	29	Las Vegas, Nev.	71.0	SSW	10,250	9	Denver, Colo.
											60.0	SW	9,300	9	Ely, Nev.
															Las Vegas, Nev.

¹ Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.² Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.³ South Carolina, Georgia, Florida, and Alabama.⁴ Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.⁵ Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.⁶ Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.⁷ Montana, Idaho, Washington, and Oregon.⁸ Wyoming, Colorado, Utah, northern Nevada, and northern California.⁹ Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

Precipitation during September was generally well above normal in the central plains states from Texas northward to western Wisconsin. In addition to local flooding that was quite general in this area, local flooding occurred in eastern New York and in the Pecos River in New Mexico, and rather prolonged flooding with high stages in the extreme lower Rio Grande.

Notable among the local floods were the destructive floods in Pierce and Dunn Counties in western Wisconsin.

The streams especially affected were the Eau Galle and Red Cedar Rivers, and Spring Valley, Wis., in a narrow flood plain of the Eau Galle River, was severely damaged. These floods resulted from unusually intense rains during the night of September 17-18 over a small area.

Atlantic Slope drainage.—General rains occurred over the entire Atlantic Slope drainage on September 26-27. The amounts were moderate to heavy. A rise resulted in most of the streams and flood stage was reached or exceeded at a few points.

In the upper Hudson River basin rains of 4.5 to 6 inches fell in a 24-hour period and caused some flooding princi-

pally in the smaller tributaries to the upper Hudson River and the Mohawk River. The damage caused was largely to roads and bridges.

The heaviest rain reported in the Schuylkill River Basin during the storm period was 5.85 inches, at Port Clinton, Pa. The river rose 10 feet in less than 24 hours, reaching 14.7 feet at Reading, Pa., on the 28th (flood stage 13 feet). Flood stage was not reached at Pottstown, Pa., the next downstream gaging station.

Sharp rises also occurred in the Lehigh and in the Delaware Rivers. Near-flood stages were reached in the upper Lehigh River on the 27th and in the lower portion on the 28th. The Delaware River did not reach flood stage at any of the gaging stations. Precipitation in the Lehigh Basin averaged about 5 inches, the rainfall occurring in a period of 24 hours or slightly longer.

In the upper Susquehanna River Basin, rises occurred but with only slight overflows in the Chenango River.

Heavy rains in the Carolinas on September 6-7 caused moderate rises in the rivers in the eastern part of the State. Slight overflows were recorded in the Neuse, Broad, and Catawba Rivers.

Upper Mississippi Basin.—Precipitation over much of the upper basin during September was much above normal. Continued rains occurred from the 12th to the 19th. On the 16th a low-pressure system developed over the northern Plains States, advancing into the upper Mississippi Basin by the 17-18th. Moist maritime tropical air over the lower Ohio Valley and the Great Lakes was lifted by a cold wedge of continental polar air in northwestern Wisconsin and resulted in unusually intense rains during the night of the 17th over a small area, especially in the Eau Galle and Red Cedar River watersheds. The most damaging flood occurred in Spring Valley, Wis., in the narrow flood plain of the Eau Galle River, which has a drainage area of only 78 square miles above the flooded town.

In Spring Valley, with about 260 homes, there were only 25 of these that were on high enough ground to escape the destructive effects of the flood. Fortunately no lives were lost. The damages from the flood in Spring Valley and in neighboring areas in Pierce County have been estimated at more than \$1,000,000. In 11 other counties in western Wisconsin the damage from floods was estimated at about \$500,000, of which about \$300,000 resulted from flooding of the Red Cedar River in Dunn County.

Following the heavy rains of the 17-18th, floods developed in the Chippewa River from Chippewa Falls, Wis., to the mouth from the 18-21st, in the Black River, from Melrose, Wis., to the mouth from the 20-22d, and in the Wisconsin River from the 18-26th. On the Minnesota side, bankful stages were reached on the smaller tributaries such as the Root, Whitewater, Zumbro and Cannon Rivers from the 17-19th.

Heavy rainfall in the form of a thunderstorm occurred in the Lockport-Joliet, Ill., area on the night of September 7-8. At Joliet, 5.32 inches of rain was measured, of which 4.80 inches fell between 7:30 p. m. and midnight.

Missouri Basin.—Heavy general rains extended over most of the Republican River watershed and over most of central Kansas on September 2-3. In the Republican River, above bankful stages occurred from above Guide Rock, Nebr., to below Clay Center, Kans. The average depth of rainfall over the entire basin was 3.2 inches. On the morning of the 2d, the rainfall over Frenchman Creek was 5.7 inches and over Medicine Creek, 3.8 inches.

Near record-breaking overflows occurred in the lower Solomon and Smoky Hill Rivers, and in the Saline River at and below Tescott, Kans. These floods resulted from rains, totalling from 5 to 7 inches, that fell in the late afternoon and night of September 2. At Tescott, Kans., the crest of 29.3 was just 0.3 foot below the highest of record in 1935. At Niles, Kans., the crest stage of 30.3 on September 4 was the highest of record except the flood of 1903 which left a high water mark of 32.3 feet.

The flood waters from the Saline and Solomon Rivers produced a crest of 29.6 feet at Enterprise, Kans., in the Smoky Hill, on September 7, exceeded only by the flood of 1903, when the crest from high water marks was 32 feet, and that of October 1941, when the crest was 30.1 feet.

Arkansas Basin.—Slight overflows occurred principally in the upper Neosho River and in portions of the South Canadian River.

Red Basin.—As a result of heavy rains in southwestern Arkansas from September 6 to 9, the upper Ouachita River and the Little Missouri River were in flood for two days. The overflow in the Little Missouri caused considerable damage to matured crops.

West Gulf of Mexico drainage.—Precipitation over the Guadalupe and Nueces River basins for the period September 7-9, averaged about 4.5 inches in the Guadalupe and 5.5 inches in the Nueces. Heavy floods resulted in both streams and although crest stages at gaging points were not as high as the July 1942 flood by 1 to 6 feet, in some sections the overflows exceeded the July flood. This was due to the streams being blocked by trees blown down during the hurricane on the last of August. Damage was greatest to matured crops.

A rather severe flood in the Pecos River, early in September, resulted from extremely heavy precipitation over the basin above Fort Sumner, N. Mex. The rainfall in a 24-hour period in this area amounted to 6.7 inches at Anton Chico, N. Mex., and several other stations reported more than 5 or 6 inches. Twenty stations in the area of heavy rainfall, which extended into the headwaters of the Canadian River, reported the greatest 24-hour amounts of record. Unofficial reports indicate maximum amounts of 8 to 10 inches in the drainage area of the Rio Pintada above Alamogordo Dam.

The most serious damage occurred in the vicinity of Fort Sumner, with total losses in that area estimated at \$120,000. Below this area losses amounted to about \$45,000.

Due to heavy rains over the Conchos River watershed, in the northwestern part of Mexico, during the last half of August and the first few days of September, a steady and strong rise took place in that river. The Conchos empties into the Rio Grande at Presidio, Tex., and a serious flood developed there. The crest occurred on September 9, when a flow of 60,000 second-feet was observed. The water backed up for about 4 miles above Presidio and prolonged flooding occurred over that section and about 7 miles below Presidio. Damage, mostly to matured crops, has been estimated at more than \$300,000.

Rather heavy rains over the Rio Grande watershed north of Del Rio and Laredo, Tex., plus a heavy discharge from upstream, caused a prolonged period of high water in the lower Rio Grande, particularly from Mercedes, Tex., downstream. An all-time high stage of 19.9 feet was reached at Brownsville, Tex., on September 16, 0.2 foot higher than the previous high stage in October 1936. The unusually high stage was probably due to changes in the channel and the fact that the levees were in better

shape on the Mexican side than in the past. Most of the flooding was within the main levees where considerable farming is done. Damage was greatest to crops in the area below Brownsville. The total damage in the extreme lower Rio Grande has been estimated at more than \$200,000.

FLOOD-STAGE REPORT FOR SEPTEMBER 1942

[All dates in September unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE					
Schuylkill: Reading, Pa.	<i>Feet</i> 13	27	28	<i>Feet</i> 14.7	28
Chenango:					
Sherburne, N. Y.	8	27	27	8.9	27
Greene, N. Y.	8	27	27	8.1	28
Neuse:					
Smithfield, N. C.	13	8	10	14.8	9
Goldsboro, N. C.	14	12	14	14.8	13
Broad: Blairs, S. C.	14	8	8	14.7	8
Catawba: Catawba, S. C.	11	8	8	11.2	8
MISSISSIPPI SYSTEM					
<i>Upper Mississippi Basin</i>					
Chippewa: Holcombe, Wis.	22	18	21	23.2	19-20
Black: Galesville, Wis.	12	21	21	13.0	21
Wisconsin:					
Merrill, Wis.	11	18	21	13.6	19
Knowlton, Wis.				20.95	19
Wisconsin Rapids, Wis.	12	20	21	12.5	20
Portage, Wis.	17	23	25	18.1	23-24
<i>Missouri Basin</i>					
Solomon:					
Beloit, Kans.	18	4	6	22.25	5
Niles, Kans.	24	4	9	30.3	4
Saline: Tescott, Kans.	25	3	4	29.3	3
Smoky Hill:					
Lindsborg, Kans.	21	3	4	21.8	4
Enterprise, Kans.	26	6	11	29.6	7
Republican:					
Guide Rock, Nebr.	10	3	4	11.2	4
Scandia, Kans.	10	3	5	11.2	4

FLOOD-STAGE REPORT FOR SEPTEMBER 1942—Con.

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
Republican—Continued.					
Concordia, Kans.	<i>Feet</i> 8	3	5	<i>Feet</i> 8.9	4
Clay Center, Kans.	15	5	6	16.2	5
Kansas: Manhattan, Kans.	17	6	6	17.9	6
		9	9	17.2	9
Arkansas Basin					
Cimarron: Perkins, Okla.	11	Aug. 14	Aug. 14	11.7	Aug. 14
Neosho:					
Burlington, Kans.	23	5	6	26.65	5
Iola, Kans.	15	6	7	17.1	7
Chanute, Kans.	20	7	7	20.0	7
North Canadian: Yukon, Okla.	8			13.0	26
Canadian: Canadian, Tex.	5	5	5	5.6	5
Red Basin					
Little Missouri: Boughton, Ark.	20	11	12	22.45	11
Ouachita:					
Arkadelphia, Ark.	17	10	11	17.9	10
Camden, Ark.	26	14	16	27.0	15
WEST GULF OF MEXICO DRAINAGE					
East Fork of Trinity: Rockwall, Tex.	10	9	10	10.2	9-10
Guadalupe:					
Gonzales, Tex.	20	9	12	32.2	10
Cuero, Tex.	23	12	13	27.0	12
Victoria, Tex.	21	11	15	28.6	15
Nueces:					
Cotulla, Tex.	15	7	10	17.25	8
Three Rivers, Tex.	37	10	15	39.2	14
Pecos:					
Santa Rosa, N. Mex.	10	1	2	19.9	1
Ft. Sumner, N. Mex.	5	1	2	15.5	2
Roswell, N. Mex.	15	2	3	17.4	3
Rio Grande:					
Del Rio, Tex.	15	13	14	15.8	13
Eagle Pass, Tex.	16	14	14	16.1	14
Hidalgo, Tex.	21	11	11	21.0	11
		16	18	21.5	17
Mercedes, Tex.	21	8	20	23.3	12
Brownsville, Tex.	18	9	20	19.9	16

¹ Estimated.